Annual Energy Savings

A_{coll} = collector area   _____ ft^2

t_{hours} = time that there is airflow through the collector (length of collector operating day)   _____ hours/day

t_{days} = time that there is airflow through the collector (length of collector operating week)   _____ days/week

t_{weeks} = time that there is airflow through the collector (length of collector operating season)   _____ weeks/year

q_{solar} = useful energy from the collector (from Map 1)   _____ $kBtu/ft^2$-year

q_{fan} = fan energy for airflow through the collector (typically about 1 W/ft^2)   _____ W/ft^2

U_{wall} = heat loss coefficient for the building wall   _____ $Btu/°F$-ft^2-hour

HDD = annual heating degree-days (from Map 2)   _____ °F-days/year

E_{htg} = efficiency of the conventional heating system   _____ fraction

Q_{solar} = solar energy collected (MBtu/year)

Q_{wall} = wall heat recapture (MBtu/year) (only significant for very poorly insulated walls)

Q_{saved} = thermal energy savings (MBtu/year)

Q_{fan} = fan energy use (kWh/year)

Thermal Energy Savings:

$$Q_{solar} = \underset{A_{coll}}{\_\_\_\_} \times \underset{q_{solar}}{\_\_\_\_} \times (\underset{t_{days}}{\_\_\_\_} \div 7) \div 10^3 = _____ \; MBtu/year$$

$$Q_{wall} = \underset{A_{coll}}{\_\_\_\_} \times \underset{U_{wall}}{\_\_\_\_} \times \underset{t_{hours}}{\_\_\_\_} \times (\underset{t_{days}}{\_\_\_\_} \div 7) \times \underset{HDD}{\_\_\_\_} \div 10^6 = _____ \; MBtu/year$$

$$Q_{saved} = (\underset{Q_{solar}}{\_\_\_\_} + \underset{Q_{wall}}{\_\_\_\_}) \div \underset{E_{htg}}{\_\_\_\_} = _____ \; MBtu/year$$

Electrical Energy Parasitics:

$$Q_{fan} = \underset{A_{coll}}{\_\_\_\_} \times \underset{q_{fan}}{\_\_\_\_} \times \underset{t_{hours}}{\_\_\_\_} \times \underset{t_{days}}{\_\_\_\_} \times \underset{t_{weeks}}{\_\_\_\_} \div 10^3 = _____ \; kWh/year$$

Figure 9. Energy-savings worksheet.